DOCUMENT RESUME

ED 312 448 CE 053 536

| | |
|---|---|
| TITLE | Identification of Occupational Areas for Indiana's Future. Final Report of the Technology Forecasting Task Force. |
| INSTITUTION | Indiana State Commission on Vocational and Technical Education, Indianapolis. |
| PUB DATE | 89 |
| NOTE | 42p. |
| PUB TYPE | Reports - Research/Technical (143) |
| EDRS PRICE | MF01/PC02 Plus Postage. |
| DESCRIPTORS | Adult Education; Agriculture; *Educational Needs; *Emerging Occupations; *Futures (of Society); Health Occupations; Information Technology; Job Skills; Labor Market; *Labor Needs; *Long Range Planning; Manufacturing Industry; Prediction; Relevance (Education); Science and Society; Technological Advancement; *Vocational Education |
| IDENTIFIERS | *Indiana |

ABSTRACT

A task force representing the Indiana private sector was convened for two purposes: to (1) identify the impact of technology on required worker skills, the labor market, and the vocational education, training, and employment system; and (2) identify occupational areas that should be future growth areas for the state. Task force members reviewed local, state, and national occupational projections; labor market information; current demographic information and projections; and employment trends. In order to validate their preliminary data, the task force then conducted a survey of 32 professional, state, and academic organizations and groups, of which 17 responded for a response rate of 53%). As a result of the survey, the task force revised their data and developed recommendations based on survey responses. Overall, they accomplished the following tasks; (1) defined three occupational levels (operators, maintainers, and developers); (2) identified occupational areas for Indiana's future (health, industrial by-products, data processing, manufacturing, agriculture, management, service industries, transportation, and sales/marketing); (3) identified skills needed across all businesses and industries (computer literacy; technological literacy; ability to increase productivity in an environment of limited resources and increased competition; increased skills in mathematics, communications, reading, applied science, and reasoning; skills required to respond to unpredictable circumstances; and skills in electronics, fabrication, and use and understanding of data processing/artificial intelligence applications for manufacturing, health technology, and data processing); (4) listed their general concerns regarding long-range forecasting; occupational forecasting; career ladders, supply, demand, and quality; and barriers to career planning and advancement; and (5) made recommendations concerning education and training for Indiana's future. (Six appendices provide a list of members of the task force; a list of Dictionary of Occupational Titles job descriptions for the occupations identified by the task force; a summary of comments on the survey; a list of survey respondents by instituiton; and a list of materials reviewed by the task force.) (NLL)

ED312448

# IDENTIFICATION OF OCCUPATIONAL AREAS FOR INDIANA'S FUTURE

# FINAL REPORT OF THE TECHNOLOGY FORECASTING TASK FORCE

## Indiana Commission on Vocational and Technical Education

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

[signature]

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."



BEST COPY AVAILABLE

# Identification of Occupational Areas for Indiana's Future

Final Report
of the
Technology Forecasting Task Force

Indiana Commission on Vocational and Technical Education

325 West Washington Street
Indianapolis, Indiana 46204
(317) 232-1820

The Indiana Commission on Vocational and Technical Education complies with all federal regulations prohibiting discrimination on the basis of race, religion, national origin, sex, age, handicap, or veteran status in matters pertaining to admissions, employment and access to programs.

Approved by the Standing Technical Committee
for
Curriculum Development and Review
July 20, 1989

Presented to the Indiana Commission on
Vocational and Technical Education
September 14, 1989

**Technology Forecasting Task Force Members**
**Ms. Cynthia Autry - Forum Group, Inc.**
**Mr. Jeff Boese - Indiana Grain and Feed Association**
**Mr. Robert Braun - EDS, Delco Electronics**
**Dr. A. Donald Duke - SEA Group, Inc.**
**Mr. Albert Estes - Retirement Properties, Inc., Chairman**
**Mr. Don Klein - Ball Corporation**
**Mr. Joseph Pictor - Methodist Hospital of Indiana, Inc.**
**Ms. Eunice Rush - EDS, Delco Electronics**
**Mr. David Snyder - EDS, Delco Electronics**
**Mr. Bob Ward - U. S. Steel**

# TABLE OF CONTENTS


INTRODUCTION ..... 1

I. DEFINITIONS OF OCCUPATIONAL LEVELS ..... 2

II. LIST OF IDENTIFIED OCCUPATIONAL AREAS ..... 3

A. Identification of Occupational Areas for Indiana's Future ..... 3

III. IMPLICATIONS FOR EDUCATION AND TRAINING ..... 6

IV. GENERAL CONCERNS AND OBSERVATIONS ..... 7

A. Long-Range Forecasting ..... 7

B. Occupational Forecasting ..... 7

C. Career Ladders ..... 7

D. Supply, Demand, and Quality ..... 8

E. Barriers ..... 8

V. RECOMMENDATIONS ..... 10

VI. APPENDICES ..... 12

A. Members of Technology Forecasting Task Force ..... 13

B. Job Descriptions, Identification of Occupational Areas ..... 14

C. Summary of Comments on the Survey ..... 32

D. Survey Respondents by Institution ..... 35

E. List of Materials Reviewed by the Task Force ..... 36

## Introduction:

The Technology Forecasting Task Force was convened by the Standing Technical Committee for Curriculum Development and Review of the Indiana Commission on Vocational and Technical Education in 1987. The Task Force had two purposes. The first was to identify the impact of technology on required worker skills, the labor market and the vocational and technical education, training and employment system. The second was to identify occupational areas that should be future growth areas for the state. Their recommendations will help professionals in vocational and technical education, training and employment plan new programs, modify or develop new curriculum, and develop other program improvement activities.

The members of the Task Force represented the private sector in business, industry, agriculture, health, manufacturing and information technology/communications. A list of members can be found in Appendix A.

The Task Force reviewed local, state and national occupational projections, labor market information, current demographic information and projections, and employment trends. A bibliography of the reviewed materials can be found in Appendix E.

In April 1988, the Task Force heard presentations from Dr. John Hague of the Corporation for Science and Technology, staff of the Indiana Department of Employment and Training Services and Indiana Commission on Vocational and Technical Education. At this time, the Task Force developed the rough draft of the "Identification of Occupational Areas for Indiana's Future." The Task Force identified occupational areas that were determined to be areas of growth in Indiana. Task Force members had major concerns about the accuracy of the data at state, region or community levels and about the difficulties of developing specific and long-term projections (level of aggregation). They questioned the utility of long-range forecasts in determining educational program planning, particularly in the most usual case where planners do not have a clear understanding of the limitation of or guidance on appropriate use of forecasts. Therefore, the group focused on needs for the next three to five years and on those occupations that will require vocational and technical education or training.

The Task Force was concerned about the accuracy of any forecasting due to the difficulties of developing projections and the limitations of available information. Therefore, the Task Force requested that the identified occupational areas be validated through a survey. The survey occurred in September 1988 and included professional organizations; state agencies; the Office of Manpower Studies, Purdue University; and the Indiana Business Research Center, Indiana University. Seventeen of thirty-two groups responded to the survey for a response rate of 53%. A list of the responding organizations can be found in Appendix D. The Task Force revised the definitions of occupational levels, occupational areas and developed recommendations based on survey responses.

## I. Definitions of Occupational Levels

The Task Force adapted definitions of occupational levels based on information from the Illinois State Board of Education. The definitions helped the Task Force as it developed its initial list of occupational areas.

The definitions, which are listed below, attempted to clarify the complex relationships between an occupational title and its level within an organization. Also, the Task Force wished to indicate some minimal educational and experiential requirements of various occupations. Another concern of the Task Force was the concept of a career ladder within an organization or occupation. Advancement often requires additional education and training, and the definitions reflected this requirement. The consensus of the Task Force remained that these definitions are useful for an initial organizational process, but were certainly not final.

Some key concepts of the definitions were as follows:

1. OPERATORS: Individuals who enter or provide information for production, service or technical systems. The positions are entry-level and often are closely supervised. The individual may have limited experience in an occupation and may receive extensive on-the-job training. The minimum educational level is a high school diploma with work-related experience and a general background in applied science, mathematics and communications as well as in the occupational area.
2. MAINTAINERS: Individuals who analyze information or install, test and service systems whether of equipment, products or people. They may also have supervisory responsibilities. Individuals may have extensive training and work experience. The minimum educational level may be a certificate, license, apprenticeship training, or a two-year postsecondary associate degree with an advanced background in the appropriate area.
3. DEVELOPERS: Individuals who invent or improve systems of equipment, products or people through the application of technology and information. The positions are often managerial or administrative. Individuals have extensive and varied work experiences and training backgrounds. The minimum educational level is a four-year postsecondary degree with a comprehensive theoretical background in the appropriate area.

The Task Force emphasized that the categories were generic and applied to many occupational areas, including health and human services. The categories were not necessarily sequential. According to the Task Force, if individuals move between categories, they generally moved only one level from their entry-level category (eg. operator to maintainer). Movement is limited due to individual decisions, workplace constraints and educational constraints.

## II. List of Identified Occupational Areas

The list of identified occupational areas indicated future directions for exploration by educators and representatives from government, labor and business/industry as they work together to address regional and local needs for education and training. The list reflected a statewide perspective and did not attempt to address regional or local needs. The Task Force hoped that the listing would stimulate further research, discussion and action on the part of educators and the private sector. Again, the Task Force wished to remind readers that these are projected needs for the next three to five years. The Task Force believed that materials from the Corporation for Science and Technology may provide a starting point for discussions of possible needs for five years and beyond.

The Task Force listed minimum educational levels for each occupational area. These have been confirmed through the survey of professional organizations, state agencies, and others. The Task Force wished to indicate some minimal educational and experiential requirements of various occupations in order to begin discussion.

However, the listing of minimum educational levels indicates only one of many possible ways to gain the necessary skill level and knowledge for each occupational area. Other methods could include cooperative education, internship, apprenticeship, adult education, skill updating and retraining, on-the-job training, continuing education, and workplace education. Many individuals will experience a variety of education and training settings as they develop their career plans and move within the identified occupational areas or between occupational areas.

**IDENTIFICATION OF OCCUPATIONAL AREAS FOR INDIANA'S FUTURE**

| OCCUPATIONAL AREA | MINIMUM EDUCATIONAL LEVEL |
|---|---|
| HEALTH: (Definitions, pages 16-27, Appendix B) | |
| Pharmacist | 5 yr. postsecondary/license |
| Perfusionist | certification, 1 yr. specialist w/medical background |
| Physical Therapy (PT) | |
| Aide | 1 yr. postsecondary |
| Assistant | 2 yr. postsecondary |
| Therapist | 3 yr. postsecondary certificate/registration |
| Occupational Therapy (same as PT) | |
| Respiratory Therapy (same as PT) | |
| LPN | license, 1 yr. |
| RN | license, 2, 3, 4 yrs. depending on program and specialty |
| Nurse Practitioner | 1 or 2 yrs. beyond 4 yrs. postsecondary |
| Nurse Aide/Assistants | high school degree, institutional preparation |
| Radiological Areas (including scanning) | licensed, on-the-job training, 2 & 4 yrs. postsecondary, retraining |

| | |
|---|---|
| Social Services | (depends on specialty and occupational level; health, counseling, assessment, referral), may be regional demand can be specialized training program, 2, 4, 6 yr. degree postsecondary |
| Medical Assistant | certificate |
| Physician Assistant | 2-4 yrs. postsecondary |
| Biomedical Technician | 2 yr. electrical/mechanical engineering technology |
| Biomedical Technologist | 4 yr. electrical/mechanical engineer or electrical engineering technologist's degree |
| Emergency Medical Technician | training course at workplace or other sites, examination |
| Paramedic | 1 yr. training, examination, after work as EMT |
| INDUSTRIAL BY-PRODUCTS: (Definitions, pages 27-28, Appendix B) | |
| **Some job titles: specifically trained and certified etc., Waste-Water Treatment Plant Operators are also Landfill Operators. | |
| Municipal Waste Management: (includes Scientists, Engineers, Technologists, Technicians) | currently at all levels: seminars, certificates, 2 yr. programs, 4 yr. postsecondary, more than 4 yr. postsecondary. Will move toward standardization as the profession matures |
| Hazardous Waste Management | same |
| Industrial Hygiene | same |
| DATA PROCESSING: (No definitions in Appendix B) | |
| Applications Programming | 4 yr. postsecondary |
| System Programming | 4 yr. postsecondary |
| System Engineering | 4 yr. postsecondary |
| Data Base Managers | 4 yr. postsecondary |
| Technicians | 2 yr. training |
| Programmer/Operators (fewer operators in future as systems move to input through sensing) | 2 yr. degree or part-time employees with OJT and high school education or specialized certificate programs |
| MANUFACTURING: (Definitions, pages 29-31, Appendix B) | |
| Quality Control/Statistical Process Control | |
| Technicians | 2 yr. postsecondary/technical |
| Technologists | 4 yr. postsecondary |
| Engineers | 4 yr. postsecondary + |
| Reliability Engineers | 4 yr. postsecondary + |
| Area Process Analysis | 4 yr. postsecondary + |
| Automated Manufacturing | |
| Technician | 2 yr. postsecondary technician level |
| Technologist | 4 yr. postsecondary |
| Engineer | 4 yr. postsecondary |
| Engineering | |
| Technician | 2 yr. postsecondary |
| Technologist | 4 yr. postsecondary |
| Engineer | 4 yr. postsecondary + |
| Skilled Crafts (Electricians, Mechanics, Millwrights, etc.) | apprenticeship, 2 yr. degree; technical certificate, 1 yr. program |
| Instrument Repair Technicians | 2 yr. postsecondary technical |

Future job titles also will be in the areas of robotics and artificial intelligence.

| | |
|---|---|
| AGRICULTURE: (No definitions in Appendix B) | |
| Genetics/Biotechnology | |
| Technician | 2 yr. postsecondary |
| Technologist | 4 yr. postsecondary |
| Engineer/Scientist | 4 yr. postsecondary + |
| MANAGEMENT: (Definitions, page 31, Appendix B) | |
| General Business Administrator | 2, 4, 5 yrs. postsecondary |
| Supervisor (industrial)(business/office) | Some in each category: 2 & 4 yr. postsecondary |
| Accountant | 4 yr. postsecondary |

**IDENTIFICATION OF AREAS ANTICIPATED TO BE FUTURE NEEDS—BUT THE TASK FORCE DID NOT HAVE RESOURCES TO COMPLETE THEIR MATRIX**

SERVICE INDUSTRIES:

Insurance
The areas of food service, personal service, etc.
Financial
Legal/Paralegal
Education
Security

TRANSPORTATION

SALES/MARKETING:

The majority of comments from the survey were supportive of the list of occupations, the definitions and the indicated minimum educational levels identified by the Task Force. Several comments have been addressed through the revision of the list and the occupational categories. A list of comments is in Appendix C.

## III. Implications for Education and Training

In the opinion of the Task Force, technology leads to a need for advanced technical skills and basic technical skills regardless of worker occupation or background. Successful workers are skilled in both areas, regardless of their occupation. Technology will continue to require increased levels of skills in employees in all occupations, whether or not employees directly use technology in their work.

Advanced technical skills traditionally have been provided by short-term training and are occupationally specific. These skills are a combination of theoretical and applied knowledge and skills developed through work experience and additional training. Often, the private sector uses on-the-job training as well as vendors, seminars, workshops and computer-aided instruction to develop these skills. Advanced technical skills are a growing training need. These skills may be provided by future partnerships between education and the private sector. Much adult training and worker retraining may fall into this category.

Basic technical skills are, or should be, provided by the secondary and postsecondary educational system. The Task Force identified some worker skills needed across all businesses and industries. This list can be considered the foundation of basic technical skills.

- computer literacy—both application and operation
- technological literacy
- "working smarter, not harder," or ways to increase productivity in an environment of limited resources and increased competition
- mathematics, communications, reading
- applied science, for some occupations
- strong reasoning skills
- the skills required to respond to unpredictable circumstances including weighing facts and correctly assessing situations in order to make innovative and appropriate responses (developing answers, proving solutions, and replicating solutions)

The manufacturing, health technology and data processing areas share a need for additional skills. These skills are both applied and basic.

- electronics—understanding of systems, operation and maintenance skills, and trouble-shooting ability
- fabrication skills including use of tools
- use of and understanding of data processing/artificial intelligence applications

## IV. General Concerns and Observations

Several concerns recurred in Task Force discussions as topics that should be kept in mind while developing plans to strengthen vocational and technical education, training and employment. These are not ranked.

### Long-Range Forecasting

The Task Force expressed concerns about attempting long-range (more than five years) forecasting. Their concerns are similar to the ones summarized in Preparing Today for Tomorrow's Economy: State Responses to Structural Change, a conference lead by Jobs for the Future in 1988.

> A panel of top econometric forecasters agreed that the art of forecasting has severe limitations. Projections' usefulness depends on their . . . degree of accuracy . . . level of aggregation . . . (and) number of scenarios. (page 2)

Task Force members had major concerns about the accuracy of the data at state, region or community levels and about the difficulties of developing specific and long-term projections (level of aggregation). Therefore, they questioned the utility of long-range forecasts (more than 5 years) in determining educational program planning, particularly in the most usual case where planners do not have a clear understanding of the limitation of or guidance on appropriate use of forecasts.

### Occupational Forecasting

The Task Force identified problems related to occupational forecasting. "Cutting edge technologies" imply many new occupations and job titles in five to ten years. The newest technologies quite often lead to occupations for those who develop technology, often graduates of higher education and graduate training, not to opportunities for those who operate and maintain technology, many of whom are well prepared by vocational and technical education and training.

Designing vocational/technical programs to provide the most futuristic training may be difficult because as the technology matures, the skills of the people required to operate and to maintain it change rapidly and unpredictably. In addition, sometimes a new idea may not be economical or useful, which further complicates planning. Also, the growth curve of any new technology is somewhat unpredictable. Educational systems, particularly at the secondary level, may have difficulty in predicting needed changes, or respond quickly enough to change. Therefore, the questions become:

- Which emerging technologies imply a future need for employees prepared by vocational/technical education and employment training? How soon will they be needed?
- What level of the educational system is appropriate to provide the needed education and training?
- Is the required training better provided outside of the public delivery system and by who?
- When will the technology require what types of workers with what mix of skills?

### Career Ladders

As a result of the rapidity of change in occupations due to technology and international competition, many employees will find they will need to be constantly alert to opportunities to move to related occupations or progress to the next levels within their occupational area in order to advance in their careers. The Task Force addressed this issue as part of a discussion on career ladders within broad occupational areas.

Briefly, career ladders were viewed as a series of related occupational titles within a broad career area within a particular type of industry or business. Career ladders implied progressively acquiring more education and experience as one moved up. For example, when a person moves from a physical therapy aide to physical therapy assistant to physical therapist. Also, the idea implies that employers often provide the resources for the required advancement through informal or formal education. Career ladders also provided a framework to address the difficult process of finding employees to fill rapidly changing occupations.

As a new occupational area emerges, the required education and job experience background is not defined. Therefore, individuals move from a variety of occupations to fill the need, or are moved by their employers. Over time, the emerging occupation becomes more defined in terms of appropriate educational, training, and job experience requirements. It is at this point that occupations traditionally become clearly defined with established educational programs and requirements for professional or other credentials.

The Task Force challenged educators and employers to find more timely, accurate, and easily accomplished ways to quickly identify emerging technologies and occupations; develop appropriate, but flexible, training or educational programs for needed workers; and

provide career ladder information to current and potential employees for improved individual planning.

**Supply, Demand, and Quality**

There is a growing imbalance between employers' growth and replacement needs and the available number of individuals being trained. Quite simply, in many occupational areas, there are not enough people in the pipeline to fill replacement needs, much less for expansion needs. A separate, but related, issue is the need to attract and retain talented individuals.

Indiana has an increasingly aging workforce, with a high percentage of skilled workers in key industries expected to retire in the next eight years, but with much fewer young workers ready to fill the vacancies. Certain areas of the state also lose many talented young workers and may also have difficulty retaining highly skilled workers. Also, public perceptions of the opportunities available in certain industries, occupations and communities are often inaccurate. Many young people and adults have not yet realized that continuing education, multiple career changes, and constantly changing workplaces are the norm. Since many Hoosiers do not currently anticipate change and plan appropriately, they are not ready to take advantage of future opportunities.

Task Force members also discussed the problem of meaningful incentives for the private sector. Many businesses and industries provide excellent internship/cooperative education opportunities as well as in-house training programs. Retention of talented graduates of employer-provided training could be a growing problem as the pool of entry-level workers shrinks. State planners should explore meaningful incentives which could result in improvement of internship/cooperative education opportunities and increased retention of those trained.

**Barriers**

The Task Force identified possible barriers to career planning and advancement. The first set of barriers may be created by current educational systems.

Task Force discussions emphasized the difficulties of gaining credit for previously developed proficiencies, of not being able to quickly move through relevant training and of problems moving among and between levels of education. The last point included the problems of transfer of credit, acceptance of the validity of education or training received at one type of institution by another and of the rigidity of educational programs and institutions. The populations who have the most difficulty with the structure and barriers of educational systems are adult learners and displaced workers.

Also, educational delivery needs to be changed to maximize the use of available technology and provide flexibility to learners. What are appropriate instructional methods and technologies to train individuals with diverse skill levels, experience and expectations? The discussion raised more questions than answers.

The Task Force was concerned that there may not be enough appropriately educated and experienced instructors for the newest or the most rapidly changing occupations, particularly those most affected by emerging technologies. Both the issue of delivery of education and training of educators may be best addressed through collaboration between private sector trainers and faculty in order to identify appropriate cost-effective strategies.

A second set of barriers has to do with the increasing educational requirements of occupational areas. As occupational areas evolve, often there is a trend toward requiring additional educational credentials, licensing and continuing education. Particularly in the beginning stages of this process, the professional requirements can be a barrier to career advancement, particularly if there is no agreement on what is required or the requirements are tightly linked to rigid systems.

A third set of barriers has to do with public perceptions that limit choices. There is a lack of knowledge among workers and educators on how careers/occupations are changing now and in the future. Individuals need to realize that continuing education is essential for career advancement and economic security for all Hoosiers, not just youth currently in school. All employees, regardless of their occupation, need continuing education so that they do not become obsolete. Also, the state has a great need to "re-tool" workers displaced by economic change and provide these experienced adults with skills for the future.

Adults and youth need help in determining the best mix of education and employment to accomplish their career goals. Effective career guidance and counseling is key for informed choices leading to career planning and management. The issue is particularly important for youth in the eighth through

tenth grades as they make educational decisions that affect their entry-level choices.

The Task Force also identified a need for earlier exposure to the world outside of school. This exposure should be meaningful to the student and provide real opportunities to integrate interests and aspirations.

Also, individuals may require assistance in identifying local changes in the labor market and using this information appropriately in their planning. They also may need support to accomplish their goals. Support could include a variety of services, depending on the individual and the situation.

The need for continuing education on the part of all citizens requires a different type of career planning than in the past. Many currently employed Hoosiers do not yet realize this. Once they do, there could be a high demand for quality services, educational programs, and public-private initiatives to meet the needs.

## V. Recommendations

Based on the survey of occupational areas and discussion among the members, numerous recommendations were made concerning education and training for Indiana's future. They do not appear in ranked order. Task Force members believed each recommendation was important. Each will require careful planning and coordination among educators, governmental agencies, and employers in order to develop effective, timely strategies.

1. If further development of the "Identification of Occupational Areas for Indiana's Future" is desired, the Task Force recommended the creation of separate task forces of experts who would be convened to further develop occupational titles, necessary skills and determine training needs; both now and in the future.
   These task forces could be convened after priority areas, categories or industry divisions are identified. One suggested method of organizing these task forces would be by the U.S. Department of Labor codes for industries and occupations. (SOC or DOT, for example)
   Respondents identified some potentially significant occupational areas that were missing from the survey. The Task Force suggests that these areas be further analyzed and included if appropriate.
   - Consulting and office management
   - Recreation and leisure occupations
   - Occupations in home health care
   - Occupations that focus on the elderly—health care, recreation, education, social services, and housing
   - The service industries, particularly in restaurant careers and food service
   - Insurance, transportation, sales and marketing, which the Task Force identified as important, but could not address
2. If forecasting beyond three to five years is desired, the Task Force strongly recommended that a special group of education, private sector, and governmental representatives work with the Corporation of Science and Technology, futurists and others in order to develop scenarios for Indiana. The members of the Task Force did not believe their membership was appropriate for long-range forecasting.
3. The Task Force suggested an examination of the current availability, ease of use and, most important, the understanding at the local level of national, state, regional and local labor market information. Is the information easily found, understood and used in educational and economic planning? Who are the users of labor market information and how do they use it? The Task Force strongly recommends the development of easily understood and accessible labor market information for use by planners at all levels, employers, educators, counselors, parents, students, and career-changers. State government should be responsible for this initiative.
4. The Task Force strongly recommended improving delivery of career planning information and counseling to youth and adults, particularly those undergoing career change. The members believed this should be a state initiative involving education, government, the private sector and citizens.
   The Task Force did not specify all areas needing improvement. However, they did identify a need for better local/regional/state labor market information for counselors, planners and citizens; the need for better counselors, particularly in the schools; a need for public education on economic trends, which impact career planning; and a need for quality services for adults available in a variety of settings.
5. A related recommendation was expressed as a need for individuals to gain work experience in their chosen career area(s) much earlier than they do now. This was particularly important for youth, but was also a need for adults undergoing career changes. All types of cooperative education, internship and joint private sector-education work experience programs should be encouraged and developed.
6. The Task Force strongly recommended identification of career ladders within high-demand and emerging occupations. These ladders should be shared with students and career-changers through public education and counseling efforts in order to aid realistic planning. Employers should clarify available and emerging career ladders and their requirements to employees in order to improve retention and encourage human resources development. Educators and employers need to collaborate to quickly identify career ladders and requirements for formal and informal education and training, particularly within emerging occupations.

7. The Task Force recommended a public education campaign to remove common misunderstandings about:
   - the future of the state's economy
   - opportunities available in certain industries, occupations and communities
   - the need for continuing education and continuous career planning by all Hoosiers

   The Task Force believed that the work of Jobs for Indiana's Future may begin to address this need. However, the members also believed coordinated efforts at all levels of government, eduction, and business/industry will be needed.

8. The Task Force also recommended development of meaningful incentives for educational institutions and the private sector, which will increase opportunities for internships, cooperative education and other workplace-based educational experiences. The incentives also will aid in increased retention of graduates of these programs. The Task Force believed that it is critical to address these issues through local, regional, state and midwestern initiatives developed by a collaboration of eduction, government and the private sector. Leadership should come from state government.

9. The Task Force recommended collaboration between private sector trainers and faculty in order to identify appropriate, cost-effective strategies to address a shortage of appropriately prepared educators for emerging and rapidly changing occupations. The same type of collaboration also may be required to develop innovative, technology-intensive methods of instructional delivery.

10. In conclusion, the Task Force recommended that educators begin effective discussions with employers in order to act; to revise systems to remove barriers. The Task Force members did not have the answer; did realize the frustrations and limitations of educators; and did not want to become educational experts. However, they expressed frustration with existing systems, while hoping that a willingness on all sides to solve problems concerning students and workers could lead to real change. All members knew of or had experienced successful cooperation leading to satisfactory solutions, however, unfortunately, these were not the norm. Their challenge to educators, and to employers, is to make solutions the norm at all levels of educational systems. Leadership should come from business/industry, education and government.

## VI. APPENDICES

A. Members of Technology Forecasting Task Force

B. Job Descriptions, Identification of Occupational Areas

C. Summary of Comments on the Survey

D. Survey Respondents by Institution

E. List of Materials Reviewed by the Task Force

# APPENDIX A

**Members of Technology Forecasting Task Force**

**BUSINESS/INDUSTRY**

Ms. Eunice Rush (served until December, 1987)
Manager for Indiana Regional Education

Mr. David L. Snyder (served until December, 1988)
EDS-Delco Electronics
Kokomo, Indiana

Mr. Robert Braun
EDS-Delco Electronics
Indianapolis, Indiana

Mr. Bob Ward
U.S. Steel
Management Service
Gary, Indiana

**AGRICULTURE**

Mr. Jeff Boese
President
Indiana Grain and Feed Association
Indianapolis, Indiana

**HEALTH**

Ms. Cynthia Autry (served until December, 1988)
Project Research Specialist
Forum Group, Inc.
Indianapolis, Indiana

Mr. Joseph Pictor
Vice President
Human Resource and Organization Development
Methodist Hospital of Indiana, Inc.
Indianapolis, Indiana

**MANUFACTURING**

Mr. Don Klein
Director of Corporate Facilities
Ball Corporation
Muncie, Indiana

**INFORMATION TECHNOLOGY/COMMUNICATIONS**

Dr. A. Donald Duke (served until January, 1988)
President
SEA Group, Inc.
Carmel, Indiana

**LIAISON FROM THE STANDING TECHNICAL COMMITTEE FOR CURRICULUM DEVELOPMENT AND REVIEW**

Mr. Albert Estes
Vice President
Retirement Properties, Inc.
Bedford, Indiana

# APPENDIX B

## Job Descriptions
## Identification of Occupational Areas for Indiana's Future

The U.S. Department of Labor publication, the Dictionary of Occupational Titles and its supplements, were consulted for generic job descriptions of the occupations identified by the Task Force. Job descriptions were found for some, but not all of the areas identified by the Task Force. Some occupational titles, particularly in agriculture and data processing, are too new to be classified by the U.S. Department of Labor. Some, in the case of supervisors, were very broad categories and are not listed.

# Job Descriptions
# Identification of Occupational Areas
# for Indiana's Future

The following job descriptions are quoted directly from the following sources:

U.S. Department of Labor, Employment and Training Administration. Fourth Edition, 1977. Dictionary of Occupational Titles. Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Labor, Employment and Training Administration. Fourth Edition Supplement, 1982. Dictionary of Occupational Titles. Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Labor, Employment and Training Administration. Fourth Edition Supplement, 1986. Dictionary of Occupational Titles. Washington, D.C.: U.S. Government Printing Office.

**Pharmacist:**

074.161-010 PHARMACIST (profess. & kin.) druggist; registered pharmacist.

Compounds and dispenses medications, following prescriptions issued by PHYSICIAN (medical ser.); DENTIST (medical ser.); or other authorized medical practitioner: Weighs, measures, and mixes drugs and other medicinal compounds, and fills bottles or capsules with correct quantity and composition of preparation. Dispenses nonprescription medication to public. Advises self-diagnosing and self-medicating patients, or provides information on potential drug interactions, potential adverse drug reactions, and elements of patient's history which might bear on prescribing decision when in advisory capacity to PHYSICIAN (medical ser.). Advises patient regarding storage for prescription medication. Assures that patient understands prescribed instructions. Answers patients questions regarding prescription medication. Stores and preserves biologicals, vaccines, serums, and other drugs subject to deterioration, utilizing refrigeration and other methods. Orders and maintains supply of drugs, chemicals, and other pharmaceutical stock. Insures potency of materials for medical use. May act as consultant to civic groups and health practitioners on matters pertaining to pharmacy. May assay medications to determine identity, purity, and strength. May instruct INTERNS (medical ser.) and other medical personnel on matters pertaining to pharmacy, or teach in college of pharmacy. May work in particular area and be designated PHARMACIST, COMMUNITY (profess. & kin.); PHARMACIST, HOSPITAL (profess. & kin.).

**Perfusionist:**

078.362-034 PERFUSIONIST (medical ser.)

Sets up and operates heart-lung machine in hospital to take over functions of patient's heart and lungs during surgery or respiratory failure: Consults with surgeon or physician to obtain patient information needed to set up heart-lung machine. Assembles, sets up, and tests heart-lung machine to insure that machine functions according to specifications. Operates heart-lung machine to regulate blood circulation and composition and oxygen and carbon dioxide levels, to administer drugs, and to control body temperature during surgery or respiratory failure of patient. Changes quantities administered at direction of physician, surgeon, or anesthesiologist. Cleans, repairs, and adjusts malfunctioning parts of heart-lung machine. GOE 10.03.02 PD L456 EC I M3 L4 SVP7 SOC 369

**Physical Therapy:**

355.354-010 PHYSICAL THERAPY AIDE (medical ser.) physical therapy attendant.

Prepares patients for physical therapy treatments, assists PHYSICAL THERAPIST (medical ser.) or PHYSICAL THERAPY ASSISTANT (medical ser.) during administration of treatments, and administers routine treatments: Assists patients to dress, undress, and put on and remove assistive and supportive devices, such as braces, splints, and slings, prior to and after treatments. Secures patients into or onto therapy equipment. Supports, turns, and stabilizes patients to assist PHYSICAL THERAPIST (medical ser.) or PHYSICAL THERAPY ASSISTANT (medical ser.) to administer treatments, tests, and evaluations. Administers routine treatments, such as hydrotherapy, hot and cold packs, and paraffin bath. Safeguards, motivates, and assists patients practicing exercises and functional activities. Observes patients during treatments and reports signs of fatigue, distress, or other problems. Transports patients to and from treatment area and transfers patients between conveyances and treatment equipment, using transfer techniques appropriate to patients' conditions. Changes linens and arranges treatment supplies and equipment according to standard procedure or written or oral instructions. Cleans work area and equipment after treatment. Prepares hydrotherapy equipment at appropriate temperature and adds disinfectant solutions. Performs miscellaneous clerical and related duties, such as answering telephone, taking messages, running errands, delivering messages, and filing patient records. May record treatment given and equipment used. May inventory and requisition supplies and equipment. May adjust fit of supportive and assistive devices for patients, as instructed. May be assigned to specific type of treatment or patient service and be designated PHYSICAL THERAPY AIDE, HYDROTHERAPY (medical ser.); PHYSICAL THERAPY AIDE, TRANSPORT (medical ser.).

076.224-010 PHYSICAL THERAPIST ASSISTANT (medical ser.) physical therapy technician.

Administers physical therapy treatments to patients, working under direction of and as assistant to PHYSICAL THERAPIST (medical ser.): Administers noncomplex active and passive manual therapeutic exercises, therapeutic massage, and heat, light, sound, water, and electrical modality treatments, such as ultrasound, electrical stimulation, ultraviolet, infrared, and hot and cold packs to treat

patients with relatively stable conditions. Administers traction to relieve neck and back pain, using intermittent and static traction equipment. Instructs, motivates, and assists patients in learning and improving functional activities, such as preambulation, transfer, ambulation, and daily-living activities. Observes patients during treatments and compiles and evaluates data on patients' responses to treatments and progress and reports orally or in writing to PHYSICAL THERAPIST (medical ser.). Fits patients for, adjusts, and trains in use and care of orthoses, prostheses, and supportive devices, such as crutches, canes, walkers, and wheelchairs. Confers with members of physical therapy staff and other health team members, individually and in conference, to exchange, discuss, and evaluate patient information for planning, modifying, and coordinating treatment programs. Gives orientation to new PHYSICAL THERAPIST ASSISTANTS (medical ser.) and directs and gives instructions to PHYSICAL THERAPY AIDES (medical ser.). Performs various clerical tasks, such as taking inventory, ordering supplies, answering telephone, taking messages, and filling out forms. May measure patient's range of joint motion, length and girth of body parts, and vital signs to determine effects of specific treatments or to assist PHYSICAL THERAPIST (medical ser.) to compile data for patient evaluations. May monitor treatments administered by PHYSICAL THERAPY AIDES (medical ser.).

076.121-014 PHYSICAL THERAPIST (medical ser.) physiotherapist.

Plans and administers medically prescribed physical therapy treatment programs for patients to restore function, relieve pain, and prevent disability following disease, injury, or loss of body part, working at hospital, rehabilitation center, nursing home, home-health agency, or in private practice: Reviews and evaluates PHYSICIAN'S (medical ser.) referral (prescription) and patient's medical records to determine physical therapy treatment required. Performs patient tests, measurements, and evaluations, such as range-of-motion and manual-muscle tests, gait and functional analyses, and body-parts measurements, and records and evaluates findings to aid in establishing or revising specifics of treatment programs. Plans and prepares written treatment program based on evaluation of available patient data. Administers manual therapeutic exercise to improve or maintain muscle function, applying precise amounts of manual force and guiding patient's body parts through selective patterns and degrees of movement. Instructs, motivates, and assists patients in nonmanual exercises, such as active regimens, isometrics, and progressive-resistive, and in functional activities, such as ambulation, transfer, and daily-living activities, using weights, pulleys, exercise machines, mats, steps, and inclined surfaces, and assistive and supportive devices, such as crutches, canes, parallel bars, orthoses, and prostheses. Administers treatments involving application of physical agents, such as light, heat, water, and electricity, using equipment such as hydrotherapy tanks and whirlpool baths, moist packs, ultraviolet and infrared lamps, low-voltage generators, and diathermy and ultrasound machines; evaluates effects of treatments at various intensities and durations and adjusts treatments to achieve maximum benefit. Administers massage, applying deep and superficial massage techniques. Administers traction to relieve neck and back pain, using intermittent and static traction equipment. Records patient treatment, response, and progress. Instructs patient and family in physical therapy procedures to be continued at home. Evaluates, fits, and adjusts prosthetic and orthotic devices and recommends modifications to ORTHOTIST (medical ser.). Confers with PHYSICIAN (medical ser.) and other health practitioners to obtain additional patient information, suggest revisions in treatment program, and integrate physical therapy treatment with other aspects of patient health care. Orients, instructs, and directs work activities of PHYSICAL THERAPIST ASSISTANTS (medical ser.) or PHYSICAL THERAPY AIDES (medical ser.). May plan and conduct lectures and training programs on physical therapy and related topics for medical staff, students, and community groups. May train and evaluate clinical students. May plan and develop physical therapy research programs and participate in conducting research. May write technical articles and reports for publications. May teach physical therapy techniques and procedures in educational institutions. May limit treatment to specific patient group or disability and be designated PHYSICAL THERAPIST, PEDIATRIC (medical ser.); PHYSICAL THERAPIST, PULMONARY (medical ser.); or specialize in conducting physical therapy research and be designated PHYSICAL THERAPIST, RESEARCH (medical ser.). In facilities where PHYSICAL THERAPIST ASSISTANTS (medical ser.) are also employed, PHYSICAL THERAPISTS (medical ser.) may primarily administer complex treatments, such as certain types of manual exercise and functional training, and monitor administration of other treatments.

**Occupational Therapist:**

355.377-010 OCCUPATIONAL THERAPY AIDE (medical ser.)

Assists OCCUPATIONAL THERAPIST (medical ser.) or OCCUPATIONAL THERAPY ASSISTANT (medical ser.) in occupational therapy program in hospital or similar institution: Performs program support services, such as transporting patient, assembling equipment, and preparing and maintaining work areas, as directed by OCCUPATIONAL THERAPIST (medical ser.) or OCCUPATIONAL THERAPY ASSISTANT (medical ser.). Assists in maintaining supplies and equipment. May assist in selected aspects or patient services as assigned.

076.364-010 OCCUPATIONAL THERAPY ASSISTANT (medical ser.)

Assists OCCUPATIONAL THERAPIST (medical ser.) in administering occupational therapy program in hospital, related facility, or community setting for physically, developmentally, or emotionally handicapped clients: Assists in evaluation of clients daily living skills and capacities to determine extent of abilities and limitations. Assists in planning and implementing programs utilizing activities selected to restore, reinforce, and enhance task performances, diminish or correct pathology, and to promote and maintain health. Designs and adapts equipment and working-living environment. Fabricates splints. Reports information and observations to supervisor. Carries out general activity program for individuals or groups. Assists in instructing patient and family in home programs as well as care and use of adaptive equipment. Prepares work materials, assists in maintenance of equipment, and orders supplies. May be responsible for maintaining observed information in client records.

076.121-010 OCCUPATIONAL THERAPIST (medical ser.)

Plans, organizes, and conducts occupational therapy program in hospital, institution, or community setting to facilitate rehabilitation of mentally, physically, or emotionally handicapped: Plans program involving activities, such as manual arts and crafts, practice in function, prevocational, vocational, and homemaking skills and activities of daily living, and participation in sensorimotor, educational, recreational, and social activities designated to help patients regain physical or mental functioning or adjust to handicaps. Consults with other members of rehabilitation team to select activity program consistent with needs and capabilities of each patient and to coordinate occupational therapy with other therapeutic activities. Selects constructive activities suited to individuals physical capacity, intelligence level, and interest to upgrade patient to maximum independence, prepare patient to return to employment, assist in restoration of functions, and aid in adjustment to disability. Teaches patients skills and techniques required for participation in activities and evaluates patients' progress. Designs and constructs special equipment for patient and suggests adaptations of patient's work-living environment. Requisitions supplies and equipment. Lays out materials for patients' use and cleans and repairs tools at end of sessions. May conduct training programs or participate in training medical and nursing students and other workers in occupational therapy techniques and objectives. May design, make, and fit adaptive devices, such as splints and braces, following medical prescription. May plan, direct, and coordinate occupational therapy program and be designated DIRECTOR, OCCUPATIONAL THERAPY (medical ser.).

**Respiratory Therapy:**

355.674-022 RESPIRATORY THERAPY AIDE (medical ser.)

Assists personnel in Respiratory Therapy Department of hospital, performing any or all of the following tasks: Cleans, disinfects, and sterilizes equipment and supplies used in administration of respiratory therapy, using sponges, brushes, and cleaning solutions, and placing items in sterilization chamber for designated time period to insure absence of contamination. Examines equipment to detect indications of disrepair, such as worn tubes or loose connections, and notifies supervisory staff when such indications are noted. Actuates equipment and observes gages measuring pressure, rate of flow, and continuity to test equipment, and notifies supervisor when malfunctions are observed. Assists supervisory personnel in maintenance of inventory records. Delivers oxygen tanks and other equipment and supplies to specified hospital locations. Answers phone and takes and relays messages regarding department operations. Assists in administration of gas or aerosol therapy to patients. GOE 10.03.02 PD M456 EC I M3 L3 SVP 4 SOC 5233

079.361-010 RESPIRATORY THERAPIST (medical ser.) inhalation therapist.

Administers respiratory therapy care and life support to patients with deficiencies and abnormalities of cardiopulmonary system, under

supervision of PHYSICIAN (medical ser.) and by prescription: Sets up and operates devices, such as respirators, mechanical ventilators, therapeutic gas administration apparatus, environmental control systems, and aerosol generators. Observes equipment gages to insure specified volumes are maintained. Performs bronchopulmonary drainage and assists patient in performing breathing exercises. Monitors patient's physiological responses to therapy, as well as equipment function. Consults with PHYSICIAN (medical ser.) in event of adverse reactions. Maintains patient's chart that contains pertinent identification and therapy information. Inspects and tests respiratory therapy equipment to insure proper operating condition. Orders major repairs when needed. May demonstrate respirator care procedures to trainees and other health care personnel.

**LPN:**

079.374-014 NURSE, LICENSED PRACTICAL (medical ser.)

Cares for ill, injured, convalescent, and handicapped persons in hospitals, clinics, private homes, sanitariums, and similar institutions: Takes and records temperature, blood pressure, and pulse and respiration rate. Dresses wounds, gives enemas, douches, alcohol rubs, and massages. Applies compresses, ice bags, and hot water bottles. Observes patients and reports adverse reactions to medical personnel in charge. Administers specified medication, and notes time and amount on patients' charts. Assembles and uses such equipment as catheters, tracheotomy tubes, and oxygen suppliers. Performs routine laboratory work, such as urinalysis. Sterilizes equipment and supplies, using germicides, sterilizer, or autoclave. Prepares food trays and feeds patients. Records food and fluid intake and output. Bathes, dresses, and assists patients in walking and turning. Cleans rooms, makes beds, and answers patients' calls. Washes and dresses bodies of deceased persons. Must pass state board examination and be licensed. May assist in delivery, care, and feeding of infants.

**RN:**

075.374-010 NURSE, GENERAL DUTY (medical ser.) nurse, staff.

Renders general nursing care to patients in hospital, infirmary, sanitarium, or similar institution: Administers prescribed medications and treatments in accordance with approved nursing techniques. Prepares equipment and aids PHYSICIAN (medical ser.) during treatments and examinations of patients. Observes patient, records significant conditions and reactions, and notifies supervisor or PHYSICIAN (medical ser.) of patient's condition and reaction to drugs, treatments, and significant incidents. Takes temperature, pulse, blood pressure, and other vital signs to detect deviations from normal and determine progress of patient. May rotate among various clinical services of institution, such as obstetrics, surgery, orthopedics, outpatient and admitting, pediatrics, psychiatry, and tuberculosis. May prepare rooms, sterile instruments, equipment, and supplies, and handling, in order of use, to assist SURGEON (medical ser.) in operations and deliveries. May make beds, bathe and feed patients, and assist in their rehabilitation. May serve as leader for group of personnel rendering nursing care to number of patients.

075.124-010 NURSE, SCHOOL (medical ser.) director, student health services.

Plans policies, standards, and objectives of school health program, in cooperation with medical authority and administrative school personnel: Participates in medical examinations and reviews findings to evaluate health status of pupils and progress of program. Instructs classes in subjects, such as child care, first aid, and home nursing, and establishes nursing policies to meet emergencies. Cooperates with school personnel in identifying and meeting social, emotional, and physical needs of school children. Administers immunizations and maintains health records of students. Works with community agencies in planning facilities to meet needs of children outside school situation. May assist in program for care of crippled children. May work in college and be designated NURSE, COLLEGE (medical ser.).

075.124-014 NURSE, STAFF, COMMUNITY HEALTH (medical ser.) public health nurse.

Instructs individuals and families in health education and disease prevention in community health agency: Visits homes to determine patient and family needs, develops plan to meet needs, and provides nursing services. Instructs family in care and rehabilitation ofpatient, and in maintenance of health and prevention of disease for family members. Gives treatments to patient following PHYSICIAN'S (medical ser.) instructions. Assists community members and health field personnel to assess, plan for, and provide needed health and related services. Refers patients with sound and emotional problems to other community agencies for assistance. Teaches home nursing material and child care, and other subjects related to individual and community welfare.

Participates in programs to safeguard health of children, including child health conferences, school health, group instruction for parents, and immunization programs. Assists in preparation of special studies and in research programs. Directs treatment of patient by NURSE, LICENSED PRACTICAL (medical ser.) and HOME ATTENDANT (per. ser.). Cooperates with families, community agencies, and medical personnel to arrange for convalescent and rehabilitative care of sick or injured persons. May specialize in one phase of community health nursing, such as clinical pediatrics or tuberculosis.

075.117-022 DIRECTOR, NURSING SERVICE (medical ser.)

Administers nursing program in hospital to maintain standards of patient care, and advises medical staff, department heads, and ADMINISTRATOR, HOSPITAL (medical ser.) in matters related to nursing service: Recommends establishment or revision of policies and develops organizational structure and standards of performance. Interprets policies and objectives of hospital nursing service to staff and community groups. Promotes good working relationships with community agencies and with other hospital departments. Assists in preparation of departmental budget. Performs personnel management functions, such as establishing personnel qualification requirements, drafting procedure manuals, initiating in-service programs, and installing record and reporting systems. Appoints professional and auxiliary nursing staff. Initiates studies to evaluate effectiveness of nursing services in relation to its objectives and cost. Participates in community health programs. May direct activities of school of nursing and coordinate activities with nursing service. May assist nursing schools with curricular problems.

075.127-014 NURSE, CONSULTANT (medical ser.)

Advises hospitals, schools of nursing, industrial organizations, and public health groups on problems related to nursing activities and health services: Reviews and suggests changes in nursing organization and administrative procedures. Analyzes nursing techniques and recommends modifications. Aids schools in planning nursing curriculum, and hospitals and public health nursing services in developing and carrying out staff education programs. Provides assistance in developing guides and manuals for specific aspects of nursing services. Prepares educational materials and assists in planning and developing health and educational programs for industrial and community groups. Advises in services available through community resources. Consults with nursing groups concerning professional and educational problems. Prepares or furnishes data for articles and lectures. Participates in surveys and research studies.

075.127-018 NURSE, HEAD (medical ser.)

Directs nursing activities and instructs nurses in organized hospital unit: Assigns duties and coordinates nursing service. Evaluates nursing activities to insure patient care, staff relations, and efficiency of service. Observes nursing care and visits patients to insure that nursing care is carried out as directed, and treatment administered in accordance with PHYSICIAN'S (medical ser.) instructions. Directs preparation and maintenance of patients' clinical records. Inspects rooms and wards for cleanliness and comfort. Accompanies PHYSICIAN (medical ser.) on rounds, and keeps informed of special orders concerning patients. Participates in orientation and instruction of personnel. Orders, or directs ordering of drugs, solutions, and equipment, and maintains records on narcotics. Investigates and resolves complaints, or refers unusual problems to superior.

075.127-022 NURSE, SUPERVISOR (medical ser.)

Supervises and coordinates activities of nursing personnel engaged in specific nursing services, such as obstetrics, pediatrics, or surgery, or for two or more patient care units to insure patient needs are met in accordance with instructions of PHYSICIAN (medical ser.) and hospital administrative procedures: Plans activities of units and coordinates activities with other patient care units. Consults with NURSE, HEAD (medical ser.) on specific nursing problems and interpretation of hospital policies to insure patient needs are met. Plans and organizes orientation and in-service training for unit staff members, and participates in guidance and educational programs. Assists in formulating unit budget. Engages in studies and investigations related to improving nursing care.

075.117-010 CONSULTANT, EDUCATIONAL, STATE BOARD OF NURSING (gov. ser.) director, educational board of nurse examiners.

Directs activities concerned with maintaining educational standards established by board of nursing or other legally authorized agency: Participates in development and implementation of philosophy, purpose, policies, and plans of board of agency, and consults with and advises administrators of nursing schools

in regard to curricula and facilities for instruction. Plans and conducts surveys of nursing schools and advises institutions desiring to establish schools on policies and procedures. Maintains current and comprehensive records and reports and keeps informed on trends and developments within the profession. May assist with administrative functions.

075.117-014 DIRECTOR, COMMUNITY-HEALTH NURSING (medical ser.) director, public-health nursing.

Administers nursing service in community health agency: Coordinates and evaluates nursing activities in agency to insure balanced and adequate program, and to formulate progressive programdesigned to meet changing needs of community. Directs collection, analysis, and interpretation of statistics significant to program planning and budget preparation. Prepares and submits budget estimates for nursing activities. Participates in establishing programs for guidance and professional development of nursing staff, and in establishing personnel policies, qualifications, and salaries. Recruits, selects, and assigns personnel for nursing services. Plans nursing consulting services. Participates in community planning concerning health and social welfare programs. Consults with advisory committee in establishment of medical policies of community health agency.

075.117-018 DIRECTOR, EDUCATIONAL, COMMUNITY-HEALTH NURSING (medical ser.) director, educational, public-health nursing.

Plans and directs educational program for community health agency: Develops educational plans for in-service education and orientation of health personnel. Confers with supervisors and staff to insure efficiency of program. Cooperates with nursing specialists and supervisors to organize educational programs for staff and community. Obtains educational materials for use in teaching and demonstrating nursing and other health-related activities. Confers with administrative personnel to determine procedures and techniques for patient care and to implement new programs. Assists in selecting nursing candidates and in orienting new employees. Cooperates with nursing schools and colleges in provided supervised field instruction for students to gain work experience and observe nursing techniques. Conducts surveys and analyses to determine adequacy of educational materials and effectiveness of program.

075.117-026 DIRECTOR, OCCUPATIONAL HEALTH NURSING (medical ser.) director, industrial nursing.

Plans with management, medical director, and legal counsel scope and objectives of nursing service in industrial establishment, and directs nursing activities: Determines qualifications, duties, and responsibilities of nursing staff, and assists in selection. Arranges for orientation of newly appointed nursing staff in company policy and nursing procedures. Prepares and maintains nursing policy and procedure manual. Evaluates nursing service and assists in evaluation of total health service. Establishes system of records and reports. Advises management in development and maintenance of plant sanitation and housekeeping practices. Develops nursing procedures for emergency and followup care of occupational and nonoccupational injuries and illnesses. Provides for health counseling and health education on individual or group basis. Interprets nursing functions in interdepartmental planning and coordination of health and welfare benefit programs. May visit branches and subsidiaries of company periodically to evaluate nursing service.

075.117-030 DIRECTOR, SCHOOL OF NURSING (medical ser.) dean, school of nursing.

Directs and administers educational program in school of nursing: Assists in preparation of budget, and administers program within budgetary limitations. Defines and interprets aims and policies of school. Interviews and appoints faculty and administrative staff. Participates in planning, curriculum and schedule of instruction. Participates in establishing qualifications for faculty, staff, and students and in recruiting eligible candidates. Arranges with hospital and other institutions and agencies for students to use their facilities, under faculty supervision for clinical experience. Maintains student records of educational experience and achievement. May arrange student living accommodations, and social and recreational opportunities. May advise institutions on educational problems.

075.117-034 EXECUTIVE DIRECTOR, NURSES' ASSOCIATION (medical ser.) executive secretary, nurses' association.

Administers program of professional nurses' association, as formulated by board of directors and association members: Participates in establishing objectives and policies of association, and interprets program to members and general public at large and professional meetings. Assists in organizing committees and

aids in attaining objectives in such matters as legislation affecting nursing, employment conditions, health programs, and research designed to facilitate professional growth and efficiency. Publicizes program of association through various media.

075.121-010 NURSE, INSTRUCTOR (medical ser.)

Demonstrates and teaches patient care in classroom and clinical units to nursing students and instructs students in principles and application of physical, biological, and psychological subjects related to nursing: Lectures to students, conducts and supervises laboratory work, issues assignments, and directs seminars and panels. Prepares and administers examinations, evaluates student progress, and maintains records of student classroom and clinical experience. Participates in planning curriculum, teaching schedule, and course outline. Cooperates with medical and nursing personnel in evaluating and improving teaching and nursing practices. May specialize in specific subject, such as anatomy, chemistry, psychology, or nutrition, or in type of nursing activity, such as nursing of medical or surgical patients.

075.127-010 INSTRUCTOR, PSYCHIATRIC AIDE (education)

Provides clinical and academic instruction in psychiatric nursing methods and procedures for PSYCHIATRIC AIDES (medical ser.): Plans curricular content and sequence. Prepares schedules and arranges for lectures given by members of hospital staff, or prepares orientation course for psychiatric aide trainees. Prepares study material and presents lectures and demonstrations. Observes student progress, conducts examinations, and compiles records. Confers with students and evaluates performances at end of training course. Assists with assignment of students to units.

075.127-026 NURSE, SUPERVISOR, COMMUNITY-HEALTH NURSING (medical ser.) supervisor, public-health nursing.

Supervises and coordinates activities of nursing personnel in community health agency: Serves as liaison between staff and administrative personnel. Develops standards and procedures for providing nursing care and for evaluating service. Provides orientation, teaching, and guidance to staff to improve quality and quantity of service. Evaluates performance of personnel and interprets nursing standards to staff, advisory boards, nursing committees, and community groups. Recommends duty assignment of nursing personnel and coordinates services with other health and social agencies to render program more effective. Reviews, evaluates, and interprets nursing records, vital statistics, and other data affecting health service in order to assess community needs and to plan and implement programs to meet these needs. Assists in planning educational programs for nurses, related professional workers, and community groups to meet needs of personnel and practitioners. Assists in preparation of agency budget. May plan for and participate in field research related to community health nursing.

075.137-010 NURSE, SUPERVISOR, OCCUPATIONAL HEALTH NURSING (medical ser.) nurse supervisor, industrial nursing.

Directs employee health services of industrial organization: Interprets plant and departmental health policies and regulations to nursing staff and employees. Coordinates activities of personnel rendering assistance to PHYSICIAN (medical ser.) and nursing care to employees. Trains nursing staff in techniques of industrial nursing. Participates in planning and executing health information programs designed to improve efficiency and reduce absentee and accident rates. Assists workers in securing medical or other aid. Establishes work schedules for nursing staff and requisitions supplies. May conduct classes in first aid and home nursing for employees. May recommend appointment of nursing personnel.

075.264-014 NURSE-MIDWIFE (medical ser.)

Provides medical care and treatment to obstetrical patients under supervision of OBSTETRICIAN (medical ser.), delivers babies, and instructs patients in prenatal and postnatal health practices: Participates in initial examination of obstetrical patient, and is assigned responsibility for care, treatment, and delivery of patient. Examines patient during pregnancy, utilizing physical findings, laboratory test results, and patient's statements to evaluate condition and insure that patient's progress is normal. Discusses case with OBSTETRICIAN (medical ser.) to assure observation of specified practices. Stays with patient during labor to reassure patient and to administer medication. Delivers infant and performs post partum examinations and treatments to insure that patient and infant are responding normally. When deviations from standard are encountered during pregnancy or delivery, administers stipulated emergency measures, and arranges for immediate contact of OBSTETRICIAN (medical ser.). Visits pa-

tient during postpartum period in hospital and at home to instruct patient in care of self and infant and examine patient. Maintains records of cases for inclusion in establishment file. Conducts classes for groups of patients and families to provide information concerning pregnancy, childbirth, and family orientation. May direct activities of other workers. May instruct in midwifery in establishment providing such training.

075.371-010 NURSE ANESTHETIST (medical ser.)

Administers intravenous, spinal, and other anesthetics to render persons insensible to pain during surgical operations, deliveries, or other medical and dental procedures: Positions patient and administers prescribed anesthetic in accordance with standardized procedures, regulating flow of gases or injecting fluids intravenously or rectally. Observes patient's reaction during anesthesia, periodically counting pulse and respiration, taking blood pressure, and noting skin color and dilatation of pupils. Administers oxygen or initiates other emergency measures to prevent surgical shock, asphyxiation, or other adverse conditions. Informs PHYSICIAN (medical ser.) of patient's condition during anesthesia. Records patient's preoperative, operative, and postoperative condition, anesthetic and medications administered, and related data. May give patient postoperative care as directed.

075.374-014 NURSE, OFFICE (medical ser.)

Cares for and treats patients in office, as directed by PHYSICIAN (medical ser.): Prepares patient for and assists with examinations. Administers injections and medications, dresses wounds and incisions, interprets PHYSICIAN'S (medical ser.) instructions to patients, assists with emergency and minor surgery, and performs related tasks as directed. Maintains records of vital statistics and other pertinent data of patient. Cleans and sterilizes instruments and equipment, and maintains stock of supplies. May conduct laboratory tests. May record and develop electrocardiographs and x-rays. May act as receptionist, perform secretarial duties, and prepare monthly statements.

075.374-018 NURSE, PRIVATE DUTY (medical ser.) nurse, special.

Contracts independently to render nursing care, usually to one patient, in hospital or private home: Administers medications, treatments, dressings, and other nursing services, according to PHYSICIAN'S (medical ser.) instructions and condition of patient. Observes, evaluates, and records symptoms. Applies independent emergency measures to counteract adverse developments and notifies PHYSICIAN (medical ser.) of patient's condition. Directs patient in good health habits. Gives information to family in treatment of patient and maintenance of healthful environment. Maintains equipment and supplies. Cooperates with community agencies furnishing assistance to patient. May supervise diet when employed in private home. May specialize in one field of nursing, such as obstetrics, psychiatry, or tuberculosis.

075.374-022 NURSE, STAFF, OCCUPATIONAL HEALTH NURSING (medical ser.) nurse, staff, industrial.

Provides nursing service to employees or persons who become ill or suffer an accident on premises of department store, factory, or other establishment: Administers first aid to injured persons. Attends to subsequent dressings of employees' injuries. Maintains record of persons treated, and prepares accident reports for compensation or other purposes. Gives information to employees in health education and illness prevention. Performs other duties, such as visiting employees' homes to provide nursing care and family health guidance. Cooperates with department heads and employees to promote accident prevention. Assists PHYSICIAN (medical ser.) in health examination programs. May take and develop x-rays. May oversee preparation and handling of food in company cafeteria.

075.127-030 NURSE SUPERVISOR, EVENING OR NIGHT (medical ser.)

Plans, organizes, and directs activities for evening or night shift of hospital nursing department: Establishes policies and procedures for nursing department, following directions of hospital administrators. Observes techniques of and services rendered by nursing staff to insure adherence to hospital guidelines. Demonstrates techniques for nursing students and new personnel to provide training and direction. Identifies problem areas in nursing department, such as understaffing, absenteeism, and wastefulness, and takes corrective action. Monitors use of supplies and equipment to avoid abuses and requisitions supplies. Responds to various departments requesting emergency assistance and assigns staff accordingly during emergencies. Prepares work schedule and assigns duties to nursing staff in department for efficient use of personnel. GOE 10.02.02 PD L4 56 EC 1 MI L5 SVP 8 SOC 29

**Nurse Practitioner:**

075.264-010 NURSE PRACTITIONER (medical ser.) primary care nurse practitioner.

Provides general medical care and treatment to assigned patients in facilities, such as clinics, health centers, or public health agency, working with PHYSICIAN (medical ser.): Performs physical examinations and preventive health measures within prescribed guidelines. Orders, interprets, and evaluates diagnostic tests to identify and assess patient's clinical problems and health care needs. Records physical findings, and formulates plan and prognosis, based on patient's condition. Discusses case with PHYSICIAN (medical ser.) and other health professionals to assure observation of specified practice. Submits health care plan and goals of individual patients for periodic review and evaluation by PHYSICIAN (medical ser.). Recommends drugs or other forms of treatment, such as physical therapy, inhalation therapy, or related therapeutic procedures. May refer patients to PHYSICIAN (medical ser.) for consultation or to specialized health resources fortreatment. May determine when patient has recovered and release patient. Where state law permits, may engage in independent practice.

**Nurse aide/assistants:**

355.674-014 NURSE AIDE (medical ser.) hospital attendant; nursing assistant.

Assists in care of hospital patients, under direction of nursing and medical staff: Answers signal lights and bells to determine patients' needs. Bathes, dresses, and undresses patients. Serves and collects food trays and feeds patients requiring help. Transports patients to treatment units, using wheelchair or wheeled carriage, or assists them to walk. Drapes patients for examinations and treatments, and remains with patients, performing such duties as holding instruments and adjusting lights. Dusts and cleans patients' rooms. Changes bed linens, runs errands, directs visitors, and answers telephone. Takes and records temperature, pulse and respiration rates, and food and liquid intake and output, as directed. May apply compresses and hot water bottles. May clean, sterilize, store, prepare, and issue dressing packs, treatment trays, and other supplies and be designated as NURSE AIDE, CENTRAL SUPPLY (medical ser.). May prepare patients for delivery and clean delivery rooms, and be designated as NURSE AIDE, DELIVERY (medical ser.). May bathe, weigh, dress, and feed newborn babies and be designated as NURSE AIDE, NURSERY (medical ser.). May clean, sterilize, and assemble into packs, supplies and instruments used in surgery, and maintain cleanliness and order of operating rooms and be designated as NURSE AIDE, SURGERY (medical ser.).

355.674-018 ORDERLY (medical ser.)

Performs any combination of following duties, as directed by nursing and medical staff, to care for hospitalized patients: Bathes patients and gives alcohol rubs. Cleans and shaves hair from skin area of operative cases. Measures and records intake and output of liquids, and takes and records temperature, and pulse and respiration rate. Gives enemas. Carries meal trays to patients. Lifts patients onto and from bed, and transports patients to hospital areas, such as operating and x-ray rooms, by rolling bed, or using wheelchair or wheeled stretcher. Sets up equipment, such as oxygen tents, portable x-ray machines, and overhead irrigation bottles. Places anesthesia equipment near operating table, and assists in holding patient on table during administration of anesthetic. Sets up bone fracture equipment and assists PHYSICIAN (medical ser.) in putting on casts and braces. Maintains supply of hospital clothing for attending PHYSICIAN (medical ser.). Makes beds and collects soiled linen. Cleans rooms and corridors. Bathes deceased patients, accompanies body to morgue, and places personal belongings in mortuary box. May administer catheterizations and bladder irrigations. May accompany discharged mental patients home, or those transferred to other institutions.

**Radiological areas, including scanning:**

078.162-010 RADIOLOGIC TECHNOLOGIST, CHIEF (medical ser.)

Coordinates activities of and supervises RADIOLOGIC TECHNOLOGISTS (medical ser.) engaged in taking radiographs and assisting in x-ray therapy: Assigns workers to special examinations, such as bone, chest, or gastrointestinal. Provides assistance in technical problems. Coordinates activities of x-ray department with other departments to insure efficient service. Makes minor repairs to equipment. Administers x-ray therapy under supervision of RADIOLOGIST (medical ser.) or other qualified medical personnel.

078.161-018 CHIEF TECHNOLOGIST, NUCLEAR MEDICINE (medical ser.)

Supervises and coordinates activities of NUCLEAR MEDICAL TECHNOLOGISTS (medical ser.): Assigns workers to prepare radiopharmaceuticals, perform nuclear medi-

cine studies, and conduct in vitro and ex vivo laboratory tests, and monitors activities to insure efficiency and accuracy of procedures. Develops protocols for new or revised procedures and trains department workers and other personnel in treatment theory, management of patient, and calibration and use of equipment. Administers radiopharmaceuticals under direction of PHYSICIAN (medical ser.) or other qualified medical personnel. Assists in coordinating activities with other departments and in resolving operating problems. GOE 02.04.02 PD L4 56 EC I6 M4 L5 SVP 8 SOC 365

078.361-018 NUCLEAR MEDICAL TECHNOLOGIST (medical ser.) radioisotope technologist.

Prepares, administers, and measures radioactive isotopes in therapeutic, diagnostic, and tracer studies, utilizing variety of radioisotope equipment. Prepares stock solutions of radioactive materials, and calculates does to be administered by RADIOLOGIST (medical ser.). Measures glandular activity, traces radioactive doses, and calculates amount of radiation, using equipment, such as Geiger counters, electroscopes, scalers, scintillation and positron scanners, and scintigrams. Calibrates equipment. Subjects patients to radiation as prescribed by RADIOLOGIST (medical ser.), using such equipment as radium emanation tubes and needles, x-ray machines, and similar instruments. Executes blood volume, red cell survival, and fat absorption studies, following standard laboratory techniques.

078.361-034 RADIATION THERAPY TECHNOLOGIST (medical ser.)

Operates radiation therapy equipment to treat patients with prescribed doses of ionizing radiation: Positions patient under equipment to expose necessary areas to treatment and adjusts equipment according to instructions. Calculates exposure time and intensity required, using mechanical and electronic regulating controls. Turns controls to operate and adjust equipment and regulate application. Observes dials to monitor duration and intensity of treatment. Prepares and maintains records for reviewby medical staff. GOE 02.03.04 PD L46 EC I M4 L4 SVP 6 SOC 365

078.362-026 RADIOLOGIC TECHNOLOGIST (medical ser.) x-ray technologist.

Applies roentgen rays and radioactive substances to patients for diagnostic and therapeutic purposes: Positions patient under x-ray machine, adjusts immobilization devices, and affixes lead plates to protect unaffected areas. Administers drugs or chemical mixtures orally or as enemas to render organs opaque. Adjusts switches regulating length and intensity of exposure. Assists in treating diseased or affected areas of body, under supervision of PHYSICIAN (medical ser.), by exposing area to specified concentrations of x-rays for prescribed periods of time. Prepares reports and maintains records of services rendered. Makes minor adjustments to equipment. May assist in therapy requiring application of radium or radioactive isotopes. May specialize in taking x-rays of specific areas of body.

078.364-010 ULTRASOUND TECHNOLOGIST (medical ser.)

Operates ultrasound diagnostic equipment to produce two-dimensional ultrasonic pattern and positive pictures of internal organs, for use by professional personnel in diagnosis of disease, study of malfunction or organs, and prenatal examination of fetus and placenta: Selects equipment for use in ultrasound setup according to specifications of examination. Explains process to patient, and instructs and assists patient in assuming physical position for required exposure to ultrasonic waves. Adjusts equipment controls according to specific orders and part of body to be examined. Moves transducer by hand or by manipulation of remote control device and observes sound wave display screen to note ultrasonic pattern produced. Activates equipment which automatically produces visual image of internal organs from ultrasonic pattern, or which produces continuing recorder strip printout of ultrasonic pattern. Photographs visual image of organs shown on display module, or removes recorder strip printout from machine when specified time for recording has elapsed, to obtain permanent record of internal examination. Attaches identification tag to photographs or recorder printouts to insure maintenance of records. Discusses test results with department supervisor or professional personnel to determine whether additional ultrasound examination is required, and repeats process as needed to secure desired results.

**Social services:**

195.107-030 SOCIAL WORKER, MEDICAL (profess. & kin.) social worker, clinical; social worker, health services.

Aids patients and their families with personal and environmental difficulties which predispose illness or interfere with obtaining maximum benefits from medical care: Works in close collaboration with medical doctor and other members of health team to further

their understanding of significant social and emotional factors underlying patient's health problem. Helps patient and family through individual or group conferences to understand, accept, andfollow medical recommendations and provides service planned to restore patient to optimum social and health adjustment within patient's capacity. Utilizes resources, such as family and community agencies to assist patient to resume life in community or to learn to live within patient's disability. Participates in planning for improving health services by interpreting social factors pertinent to development of program. Provides general direction and supervision to workers engaged in clinic home service program activities. Employed in general hospitals, clinics, rehabilitation centers, or related health programs. May be employed as consultant in other agencies. Usually required to have knowledge and skill in casework methods acquired through degree program at school of social work.

**Medical assistant:**

079.367-010 MEDICAL ASSISTANT (medical ser.)

Performs following duties under direction of PHYSICIAN (medical ser.) in examination and treatment of patients: Prepares treatment rooms for examination of patient. Drapes patients with covering and positions instruments and equipment. Hands instruments and materials to doctor as directed. Sterilizes and cleans instruments. Prepares inventory of supplies to determine items to be replenished. Interviews patients and checks pulse, temperature, blood pressure, weight, and height. May schedule appointments, receive money for bills, keep x-ray and other medical records, perform secretarial tasks, complete insurance forms, and maintain financial records.

**Physician assistant:**

079.364-018 PHYSICIAN ASSISTANT (medical ser.)

Provides patient services under direct supervision and responsibility of doctor of medicine or osteopathy: Elicits detailed patient histories and does complete physical examinations. Reaches tentative diagnosis and orders appropriate laboratory tests. Counsels patient and family on health and disease. Sutures minor wounds, assists in surgery, applies and removes cast and traction apparatus, and performs other therapeutic procedures under supervision of doctor of medicine or osteopathy. May have special training in particular medical specialty and be designated CHILD HEALTH ASSOCIATE (medical ser.); GYNECOLOGIST ASSISTANT (medical ser.); ORTHOPEDIC PHYSICIAN ASSISTANT (medical ser.); SURGEON'S ASSISTANT (medical ser.); UROLOGIC PHYSICIAN ASSISTANT (medical ser.).

**Biomedical technician/technologist:**

359.363-010 HEALTH EQUIPMENT SERVICER (medical ser.)

Delivers, installs, demonstrates, and maintains rental medical equipment, such as respirator, oxygen equipment, hospital beds, and wheel chairs, for use in private residences: Loads medical equipment on truck and delivers equipment to renter's or patient's residence. Unloads, installs, and sets up equipment, using handtools. Inspects and maintains rental oxygen equipment,performing such tasks as inspecting hoses and water traps to detect leaks and condensation; observing gages of oxygen analyzer, pressure gages, and other monitoring equipment to determine pressure and oxygen content of air output of compressors and concentrators; and changing filters. Maintains record on oxygen equipment by hours of usage to determine need for maintenance. GOE 10.03.02 PD H156 EC I6 M2 L3 SVP 5 SOC 5233

639.281-022 MEDICAL EQUIPMENT REPAIRER (per. protect. & med. dev.; ret. tr.) durable medical equipment repairer; wheelchair repairer.

Repairs medical equipment, such as manual or powered wheelchairs, hospital beds, and suction equipment, using knowledge of equipment function and handtools: Test operates and examines malfunctioning equipment to determine cause of malfunction. Disassembles and inspects equipment to locate defective components, such as motors, valves, and electrical controls, using test instruments and handtools. Replaces defective parts, and solders, tightens, and aligns parts which have become loose or out of adjustment, using handtools and soldering iron. Cleans, lubricates, and polishes equipment components to restore surface, using solvent, polish, rags, and grease gun. Test operates unit to insure equipment functions according to manufacturer's specifications. Occasionally installs modified parts, such as respirator equipment or foot rest onto wheelchairs, according to customer specification, and fills parts orders from customers. GOE 05.10.02 PD H346 EC I5 M2 L3 SVP 5 SOC 6179

719.261-014 RADIOLOGICAL EQUIPMENT SPECIALIST (medical ser.) radiologic electronic specialist

Tests, repairs, installs, calibrates, and modifies radiological and related equipment used in medical diagnosis and therapy, applying technical knowledge of electronic, radiological, and mechanical systems, and using manuals, test equipment, measuring instruments, handtools, and power tools: Confers with supervisor, manufacturers' representatives, equipment operators, and other workers to discuss and establish work priorities, resolve equipment related problems, and plan installation, modification, and repair procedures. Inspects and tests malfunctioning equipment to determine cause of malfunction, following learned procedures and repair manual instructions, using specialized test and analysis instruments and manufacturers' specifications. Disassembles malfunctioning equipment and removes, replaces, or repairs defective components, and readjusts components to manufacturers' specifications, using handtools, power tools, and measuring instruments. Installs and assembles radiological equipment in designated areas, following installation and assembly manuals, using handtools, power tools, and heavy equipment moving devices, and utilizing knowledge of equipment installation and assembly techniques. Tests and calibrates equipment at regular or required intervals, using test and measuring instruments and handtools to maintain manufacturers' operational specifications. Selects, devises, designs, and installs mechanical or structural hardware,using tools and utilizing knowledge of mechanics and structures to resolve special equipment operation problems and expand application capabilities. Writes narrative reports of work activities to maintain history of equipment repairs and modifications. Fabricates modification hardware, using machine and power tools, handtools, and related equipment. Demonstrates operational procedures for new or modified equipment to users. May work for manufacturer and specialize in particular line of equipment. GOE 05.05.11 PD H23456 EC 16 M5 L5 SVP 7 SOC 6179

**Emergency medical technician:**

079.374-010 EMERGENCY MEDICAL TECHNICIAN (medial ser.)

Administers first-aid treatment to and transports sick or injured persons to medical facility, working as member of emergency medical team: Responds to instructions from emergency medical dispatcher and drives specially equipped emergency vehicle to specified location. Monitors communication equipment to maintain contact with dispatcher. Removes or assists in removal of victims from scene of accident or catastrophe. Determines nature and extent of illness or injury, or magnitude of catastrophe, to establish first aid procedures to be followed or need for additional assistance, basing decisions on statements of persons involved, examination of victim or victims, and knowledge of emergency medical practice. Administers prescribed first-aid treatment at site of emergency, or in specially equipped vehicle, performing such activities as application of splints, administration of oxygen or intravenous injections, treatment of minor wounds or abrasions, or administration of artificial resuscitation. Communicates with professional medial personnel at emergency treatment facility to obtain instructions regarding further treatment and to arrange for reception of victims at treatment facility. Assists in removal of victims from vehicle and transfer of victims to treatment center. Assists treatment center admitting personnel to obtain and record information related to victims' vital statistics and circumstances of emergency. Maintains vehicles and medical and communication equipment and replenishes first-aid equipment and supplies. May assist in controlling crowds, protecting valuables, or performing other duties at scene of catastrophe. May assist professional medical personnel in emergency treatment administered at medical facility.

**Industrial By-Products**

168.267-054 INSPECTOR, INDUSTRIAL WASTE (gov. ser.)

Inspects industrial and commercial waste disposal facilities and investigates source of pollutants in municipal sewage and storm-drainage system to insure conformance with ordinance and permit requirements: Visits establishments to determine possession of industrial waste permits and to inspect waste treatment facilities, such as floor drains, sand traps, settling and neutralizing tanks, and grease removal equipment for conformance with regulations. Extracts samples of waste from sewers, storm drains, and watercourses for laboratory tests. Conducts field tests for acidity, alkalinity, and other characteristics to determine if discharged wastes will cause water pollution or deterioration of sewage facilities. Inspects sewers and storm drains to determine presence of explosive gases, using gas-analysis equipment. Reviews plans of proposed waste-treatment facilities and inspects construction to insure conformance with ordinances. Issues citations to apparent violators

of sanitation code or water-quality regulations. Compiles written reports of investigations and findings, and actions taken or recommended. May enforce ordinances concerned with commercial hauling and disposal of contents from cesspools and septic tanks into sewers. May inspect water wells for contamination and conformance with legal construction standards, and order closing of unsanitary or unsafe wells.

184.167-078 025MANAGER, SOLID-WASTE DISPOSAL (gov. ser.) superintendent, landfill operations.

Directs and coordinates, through subordinate supervisory personnel, landfill site activities concerned with solid-waste disposal for governmental sanitation agency or private refuse-disposal company: Inspects site and confers with supervisory personnel to determine procedures and methods for utilizing site area for disposal activities and to remain in compliance with specifications of environmental impact study. Plans sequences of waste disposal operations to obtain optimum utilization of site basing plans on such factors as past and predicted solid-waste disposal and land reclamation requirements, quantity of waste handled daily, and space in site required for waste handled. Insures that waste disposal activities are in compliance with public health insect and rodent control laws and regulations. Prepares records and reports on disposal activities, such as quantities of waste handled, receipts from operations, and actions taken to comply with public health and environmental regulations. May prepare operational budget for landfill waste disposal activities and submit budget to agency management. May examine loads of waste for recyclable material and direct sorting, handling, and recycling operations. May supervise workers engaged in waste disposal operations. May operate heavy equipment to compact and bury waste in private landfill disposal dump.

**Hazardous waste management:**

168.267-086 HAZARDOUS-WASTE MANAGEMENT SPECIALIST (gov. ser.)

Conducts studies on hazardous waste management projects and provides information on treatment and containment of hazardous waste: Participates in developing hazardous waste rules and regulations to protect people and environment. Surveys industries to determine type and magnitude of disposal problem. Assesses available hazardous waste treatment and disposal alternatives, and costs involved, to compare economic impact of alternative methods. Assists in developing comprehensive spill prevention programs and reviews facility plans for spill prevention. Participates in developing spill-reporting regulations and environmental damage-assessment programs. Prepares reports of findings concerning spills and prepares material for use in legal actions. Answers inquiries and prepares informational literature to provide technical assistance to representatives of industry, government agencies, and to general public. Provides technical assistance in event of hazardous chemical spill and identifies pollutant, determines hazardous impact, and recommends corrective action. GOE 11.10.03 PD S5 EC I M3 L5 SVP 7 SOC 1473

005.061-042 0025WASTE-MANAGEMENT ENGINEER, RADIOACTIVE MATERIALS (profess. & kin.)

Designs, implements, and tests systems and procedures to reduce volume and dispose of nuclear waste materials and contaminated objects: Identifies objects contaminated by exposure to radiation, such as trash, workers' clothing, and discarded tools and equipment. Analyzes samples of sludge and liquid effluents resulting from operation of nuclear reactors to determine level of radioactivity in substances and potential for retention of radioactivity, using radioactivity counters and chemical and electronic analyzers. Refers to State and Federal regulations and technical manuals to determine disposal method recommended for prevention of leakage or absorption of radioactive waste. Compares costs of transporting waste to designated nuclear waste disposal sites and reducing volume of waste and storing waste on plant site. Confers with equipment manufacturers' representatives and plant technical and management personnel to discuss alternatives and to choose most suitable plan on basis of safety, efficiency, and cost-effectiveness. Designs and draws plans for systems to reduce volume of waste by solidification, compaction, or incineration. Oversees construction, testing, and implementation of waste disposal systems, and resolves operational problems. Develops plans for modification of operating procedures to reduce volume and radioactive level, of effluents, and writes manuals to instruct workers in changes in work procedures. Advises management on selection of lands suitable for use as nuclear waste disposal sites and on establishment of effective safety, operating, and closure procedures. GOE 05.01.03 PD L4 56 EC I6 M5 L5 SVP 8 SOC 1628

**Manufacturing**

**Quality control/statistical process control technicians:**

012.261-014 QUALITY CONTROL TECHNICIAN (profess. & kin.)

Tests and inspects products at various stages of production process and compiles and evaluates statistical data to determine and maintain quality and reliability of products: Interprets engineering drawings, schematic diagrams, or formulas to arrive at specified quality and reliability standards. Selects products for tests at specified stages in production process, and tests for items, such as dimensions, performance, and mechanical, electrical, or chemical characteristics. Sets up and performs destructive and nondestructive tests on materials, parts, or products to measureperformance, life, or material characteristics. Records test data, using statistical quality control procedures and prepares data in graph or chart form. Evaluates data and writes summaries to validate or show deviations from existing standards. Suggests in written or oral form, modifications of existing quality or production standards to achieve optimum quality within limits of equipment capability. May specialize in any of the following areas of quality-control engineering as design, incoming material, process control, product evaluation, inventory control, product reliability, research and development, and administrative application.

012.267.010 INDUSTRIAL ENGINEERING TECHNICIAN (profess. & kin.)

Studies and records time, motions, methods, and speed involved in performance of maintenance, production, clerical, and other worker operations to establish standard production rate and to improve efficiency: Prepares charts, graphs, and diagrams to illustrate workflow, routing, floor layouts, material handling, and machine utilization. Observes workers operating equipment or performing tasks to determine time involved and fatigue rate, using stop watch, motion-picture camera, electrical recorder, and similar equipment. Recommends revision of methods of operation or material handling, alterations in equipment layout, or other changes to increase production or improve standards. Aids in planning work assignments in accordance with worker performance, machine capacity, production schedules, and anticipated delays. May be designated according to type of studies analyzed as METHODS-STUDY ANALYST (profess. & kin.); PACE ANALYST (profess. & kin.); TIME-STUDY ANALYST (profess. & kin.).

012.167-042 MANUFACTURING ENGINEER (profess. & kin.)

Directs and coordinates manufacturing processes in industrial plant: Determines space requirements for various functions and plans or improves production methods including layout, production flow, tooling and production equipment, material, fabrication, assembly methods, and manpower requirements. Communicates with planning and design staffs concerning product design and tooling to assure efficient production methods. Estimates production times and determines optimum staffing for production schedules. Applies statistical methods to estimate future manufacturing requirements and potential. Approves or arranges approval for expenditures. Reports to management on manufacturing capacities, production schedules, and problems to facilitate decision-making.

012.167-046 PRODUCTION ENGINEER (profess. & kin.)

Plans and coordinates production procedures in an industrial plant: Directs production departments. Regulates and coordinates functions of office and shop. Introduces more efficient production line methods. Initiates and directs other procedures to increase company output.

019.061-026 RELIABILITY ENGINEER (profess. & kin.)

Analyzes preliminary engineering-design concepts of major product, such as aircraft, navel vessel, or electronic communication or control system to recommend design or test methods for attaining customer-specified operational reliability, using knowledge of reliability engineering and other technologies: Analyzes preliminary plans and develops reliability engineering program to achieve customer reliability objectives. Analyzes projected product utilization and calculates cumulative effect on final system reliability of individual part reliabilities. Drafts failure mode and effect analysis sheets or formulates mathematical models, using computer-aided engineering equipment, to identify units posing excessive failure risks and support proposed changes in design. Enters data to simulated electrical inputs, transient conditions, temperature, stress, and other factors to develop computer models, and analyzes and adjusts design to predict and improve system reliability. Advises and confers with engineers in design review meetings to give

reliability findings and recommendations. Determines units requiring environmental testing and specifies minimum number of samples to obtain statistically valid data. Reviews subcontractors' proposals for reliability program and submits evaluation for decision. Reviews engineering specifications and drawings, proposing design modifications to improve reliability within cost and other performance requirements. Observes conduct of tests at supplier, plant, or field locations to evaluate reliability factors, such as numbers and causes of unit failures. Monitors failure data generated by customer using product to ascertain potential requirement for product improvement. GOE 05.01.04 PD S 09 10 12 13 15 M6 L5 SVP 8 SOC 1639

**Skilled crafts:**

824.261-010 ELECTRICIAN (any ind.) wirer.

Plans layout, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment: Plans new or modified installations to minimize waste of materials, provide access for future maintenance, and avoid unsightly, hazardous, and unreliable wiring, consistent with specifications and local electrical codes. Prepares sketches showing location of wiring and equipment, or follows diagrams or blueprints, insuring that concealed wiring is installed before completion of future walls, ceilings, and flooring. Measures, cuts, bends, threads, assembles, and installs electrical conduit, using such tools as hacksaw, pipe threader, and conduit bender. Pulls wiring through conduit, assisted by ELECTRICIAN HELPER (any ind.). Splices wires by stripping insulation from terminal leads with knife or pliers, twisting or soldering wires together, and applying tape or terminal caps. Connects wiring to lighting fixtures and power equipment, using handtools. Installs control and distribution apparatus, such as switches, relays, and circuit-breaker panels, fastening in place with screws or bolts, using handtools and power tools. Connects power cables to equipment, such as electric range or motor, and installs grounding leads. Tests continuity of circuit to insure electrical compatibility and safety of components, using testing instruments, such as ohmmeter, battery and buzzer, and oscilloscope. Observes functioning of installed equipment or system to detect hazards and need for adjustments, relocation, or replacement. May repair faulty equipment or systems [ELECTRICAL REPAIRER (any ind.)]. May be required to hold license. May cut and weld steel structural members, using flamecutting and welding equipment. May be designated according to work location as MINE ELECTRICIAN (mining & quarrying).

824.681-010 ELECTRICIAN (mfd. bldgs.)

Installs and repairs wiring, electrical fixtures, and fuse boxes in prefabricated and modular homes, using handtools: Reads blueprints to determine locations of equipment and conformance to building and safety codes. Measures, cuts, and installs conduit in specified panels, using handtools. Measures for location of receptacles with tape measure and installs receptacles. Cuts and connects wires according to diagrams to install fixtures, such as switches, light fixtures, and fuse boxes. Tests continuity of circuits to insure safety, using ohmmeter. Repairs faulty systems. May direct workers in boring holes in studs and running wiring. May train new workers in electrical system installation procedures.

638.281-018 MILLWRIGHT (any ind.)

Installs machinery and equipment according to layout plans, blueprints, and other drawings in industrial establishment, using hoists, lift trucks, handtools, and power tools: Reads, blueprints and schematic drawings to determine work procedures. Dismantles machines, using hammers, wrenches, crowbars, and other handtools. Moves machinery and equipment, using hoists, dollies, rollers, and trucks. Assembles and installs equipment, such as shafting, conveyors, and tram rails, using handtools and power tools. Constructs foundation for machines, using handtools and building materials, such as wood, cement, and steel. Aligns machines and equipment, using hoists, jacks, handtools, squares, rules, micrometers, and plumb bobs. Assembles machines and bolts, welds, rivets, or otherwise fastens them to foundation or other structures, using handtools and power tools. May operate engine lathe to grind, file, and turn machine parts to dimensional specifications. May repair and lubricate machines and equipment.

710.261-010 INSTRUMENT REPAIRER (any ind.)

Repairs and calibrates speedometers and other automotive gages and meters, using handtools and test equipment: Confers with customer to determine nature of malfunction. Inspects components, connections, and drive mechanisms to detect defects. Removes instrument from vehicle and disassembles, cleans, and inspects instrument to determine which parts are defective. Replaces worn and defective parts, using handtools. Tests and calibrates instruments, using mechanical and electronic devices, such as voltmeters, pressure generators, and speedometer tester. Installs instruments in vehicle, using handtools.

Computes speedometer drive ratio changes for modified vehicles. Maintains stock andparts inventory. May operate jeweler's lathe and other machines to fabricate instrument parts. May repair automotive clocks [WATCH REPAIRER (clock & watch)].

**Management**
**Accountant:**

160.167-010 ACCOUNTANT (profess. & kin.) manager, office.

Directs and coordinates activities of workers engaged in general accounting, or applies principles of accounting to devise and implement system for general accounting: Directs and coordinates activities of workers engaged in keeping accounts and records, or performing such bookkeeping activities as recording disbursements, expenses, and tax payments. Prepares individual, division, or consolidated balance sheets to reflect company's assets, liabilities, and capital. Prepares profit and loss statements for specified accounting period. Audits contracts, orders, and vouchers, and prepares reports to substantiate individual transactions prior to settlement. May represent company before government agencies upon certification by agency involved. May work independently for fee or as member of accounting firm and be designated as ACCOUNTANT, PUBLIC (profess. & kin.).

160.167-026 ACCOUNTANT, SYSTEMS (profess. & kin.) accounting system expert.

Devises and installs special accounting systems and related procedures in establishment which cannot use standardized system: Conducts survey of operations to ascertain needs of establishment. Sets up classification of accounts and organizes accounting procedures and machine methods support. Devises forms and prepares manuals required to post data and keep records. May adapt conventional accounting and recordkeeping functions to machine accounting processes and be designated ACCOUNTANT, MACHINE PROCESSING (profess. & kin.).

# APPENDIX C

## Summary of Comments on the Survey

### Part I. Occupational Category Definitions

Responses are written in under the original question and are in **boldface**.

**Definitions**

1. OPERATORS: Individuals who enter information into production, service or technical systems. The positions are entry-level. The minimum educational level is a high school diploma with work-related experience and a general background in applied science, mathematics, and communications.

   **Entry level and experience do not equate.**

   **"And" in math, science and communication implies all—not so since some elements missing in some jobs.**

2. MAINTAINERS: Individuals who install, test and service equipment, products and services. They may also have supervisory responsibilities. The minimum educational level is a two-year college associate degree with an advanced background in the appropriate area.

   **Many people get here via experience and OJT**

   **Suggest changing minimum educational level here to a one year technical certificate with an advanced background in the appropriate area**

3. DEVELOPERS: Individuals who invent or improve products and services through the application of technology. The positions are often managerial or administrative. The minimum educational level is a four year college degree with a comprehensive theoretical background in the appropriate area.

   **Many people have such jobs and technology not part of it**

   **Requirement of 4 years of college may be artificial**

   **Suggest adding an area here called APPLIERS: Individuals who improve products, processes, and services through application of technology. The positions are often supervisory. Minimum educational level is a two-year university level degree with a theoretical background and a comprehensive, lab-based practical background in the appropriate area.**

   **Suggest modifying DEVELOPERS to include the following phrase: individuals who invent or improve products, processes, and services through basic research and design.**

**Questions**

1. Are the categories of Operator, Maintainer, and Developer accurate for people who work in your occupational area(s)?

   **Yes: 4 and one comment: although the educational requirements are seldom defined as rigidly as you have done. A great deal of importance is placed on related experience.**

   **No: 4**

   **No answer indicated or person felt unable to judge: 2**

2. If not, how would you change the category(ies) to reflect the workers in your occupational area(s)?

   **Use Dictionary of Occupational Titles type of classifications**

   **Operator does not apply to licensed individuals (LPT/RN/LPN)**

   **Reference the definition of Operators. An increasing number of Indiana Manufacturing Association members are saying that entry-level positions need or will soon be needing something over and beyond a high school diploma. This is especially true as the systems in which this information is entered become more complex.**

   **Although nurses use technology, they are not a technology driven occupation. Nursing is a learned profession and applies knowledge of science and humanities in diagnosing and treating human responses to actual or potential health problems.**

   **Must include more about application of knowledge to individuals, families, and communities to diagnose and treat. May also need to include skills in treatment and prevention of disabilities and illness.**

3. Are categories missing? If so, what are these categories?

   **See suggested modifications above**

   **Graduate level preparation—specialization, leadership, teaching in the nursing area**

   **Applied—people who apply improved product to day-to-day situations**

   **Not really. These three categories would generally be sufficient.**

   **Increasingly in the future, I believe that you will see a need for a category of design technician for design, simulation, initial prototype development,**

**etc. This would be a two-year college associate degree level between your "developer" and "maintainer" categories.**

### Part II. Occupational Areas

Instructions: Review the attached list of occupational areas, educational levels, and occupational categories. Please answer the following questions regarding the identification of occupational areas for Indiana's future.

1. Is the identified occupational are one with growth potential in Indiana for the next three to five years? Why/why not?

   **Yes: 8**

   **Comments: Agree with assessment for hazardous waste management, data processing, and automated manufacturing technology assessments.**

   **Indianapolis, in particular, is becoming recognized as a major health care center, and there are currently shortages of qualified health care personnel.**

   **Particularly agree with the service industry area.**

   **They are all growth areas except the non-traditional service area. Not really a large call or growth expansion in the state. Also their current growth tends to be overstated.**

   **More jobs than nurses. See demand growing, slightly, due to increase in elderly populations IF funding is available from public and private sources.**

2. Are there missing occupational titles within the areas? If so, what titles are missing?

   **No: 3**

   **Add consulting and office management**

   **Many are missing. Separate task-forces /experts should be convened after major areas (or categories or industry divisions) are ascertained. I would use U.S. Department of Labor as the lead.**

   **Service of recreation and leisure. Agricultural areas will be relatively small in number even though growth area.**

   **Health area could be further developed—almost all areas in high demand.**

   **Big growth in home care plus elderly.**

   **Suggest using work environments as a way to categorize rather than job titles —what types of workers would you expect in a hospital, office, etc. Might help avoid the difficulties of using job /occupational titles.**

3. Are the listed educational levels correct? If not, please note corrections on the form.

   **Corrections noted. However, a few reviewers made comments here: RN-3 year level is almost non-existent. Students should not be encouraged to enter these programs and new ones should not be started.**

   **Should include high school grad...as well as postsecondary. Also many occupations can be done through appropriate experience (e.g. OJT)**

4. Do you agree with identified level of operator, maintainer, or developer? If not, please indicate the level.

   **Need much more information on the service industries, particularly in restaurant careers and food service. Employs many vocational education graduates and many others.**

   **The fields of commercial and military product development and production appear to be omitted, yet these fields employ large numbers of Hoosiers and that is likely to be the case in the future. Examples of positions there would be: design engineer, design technician, design simulation technician, computer assisted design technician, application specific integrated circuit design technician, systems design engineer, and corresponding technician, etc.**

   **Indianapolis is an insurance center and I would like to see more done in this area.**

   **Let's not get so carried away with high tech that we forget at the basic entry level, the input of data is still drudge work. True, the technology may improve and the equipment will become even more sophisticated which will lead to more expertise being needed by developers and maintainers, but in the sophistication the equipment will become more "user friendly" to allow entry level workers to use it.**

   **This material needs much work—not every occupation is technology based. Occupations/professions use technology to provide data. It is what gets done with the data that is important.**

   **The nation is moving towards two levels of nursing: associate and BSN. Career ladders should be developed**

for the one year to move to 2 year and 2 year to 4 year programs; without jeopardizing the quality of education needed to provide quality services.

Why not go back to the Department of Labor terms and categories? Also the OCCUPATIONAL OUTLOOK HANDBOOK (the 1988–89 issue) has just published. Their QUARTERLY also includes many analyses of industries, employment, and occupations with matrices/divisions/groupings, etc. Using these for Indiana would facilitate comparisons, etc.

Overall Summary

Some of these are occupational titles, some are areas or fields where a cluster of occupations pertain.

Use of "all 3" indicates to me that the classification system may not be useful.

# APPENDIX D

**Survey Respondents**

1. Corporation of Science and Technology
   One N. Capitol Avenue
   Indianapolis, IN 46204
2. Indiana Manufacturer's Association
   Monument Circle
   Indianapolis, IN 46204
3. Purdue University
   Office of Manpower Studies
   Knoy Hall of Technology
   West Lafayette, IN 47907
4. State Board of Health
   1330 W. Michigan Street
   Indianapolis, IN 46202
5. Farm Bureau Insurance Company
   130 E. Washington Street
   P.O. Box 1290
   Indianapolis, IN 46204
6. INDOICC/Dept. of Employment
   and Training Services
   150 W. Market, 7th Floor
   Indianapolis, IN 46204
7. Indiana Business Research Center
   801 W. Michigan Street
   Indianapolis, IN 46223
8. Jobs for the Future
   48 Grove Street, Suite 304
   Boston, MA 02144
9. Vocational Education Services
   840 State Road 46 Bypass
   Room 110
   Bloomington, IN 47405
10. Indiana Bankers Association
    One N. Capitol
    Suite 315
    Indianapolis, IN 46204
11. Indiana Food Processors Association, Inc.
    2120 N. Meridian Street
    Indianapolis, IN 46202
12. Indiana Restaurant Association, Inc.
    2120 N. Meridian Street
    Indianapolis, IN 46202
13. Indiana State Nurses Association
    Headquarters
    2915 N. High School Road
    Indianapolis, IN 46224
14. Insurance Institute of Indiana
    One N. Capitol Avenue
    Suite 330
    Indianapolis, IN 46204
15. Indiana Economic Development Council
    One N. Capitol Avenue
    Suite 425
    Indianapolis, In 46204
16. Indiana Retail Council, Inc.
    One N. Capitol Avenue
    Suite 430
    Indianapolis, IN 46204
17. Indiana Association of Home Health
    Care Agencies
    8900 Keystone Crossing
    Suite 680
    Indianapolis, IN 46402

# APPENDIX E

**List of Materials Reviewed by the Technology Forecasting Task Force**


1. Berryman, S. E. "Breaking Out of the Circle: Rethinking Our Assumptions about Education and the Economy." Occasional paper No. 2, presentation at the National Conference of the American Society for Training and Development, 21–26 June 1987.
2. Corporation for Science and Technology. "Technology Overview Report," 24 April 1987 and "A Compilation of 'Early Returns' Headlines," 5 May 1987. Indianapolis, Indiana.
3. "Employment Opportunities 1986–2000." For Your Information, IAAVD, 21 Dec. 1987.
4. "Equipping Workers for the High Skill Jobs." Palomba, N. and Bosworth, B. The Indianapolis Star, 27 Jan. 1988.
5. "Good Jobs are Going to Waste." U. S. News and World Report, p. 70, 12 Sept. 1988.
6. "'High Tech' Vocational Education Required to Fill Many Future Jobs." AVA Update, p. 5, Feb. 1988.
7. Hudson Institute. Excerpts from Vocational Education and Economic Development in Indiana: Prospects and Policies for the Future. Indianapolis, Indiana. 15 Jan. 1987.
8. Indiana Business Review, Vol. 61, No. 6, December 1986.
9. Jobs for Indiana's Future. Various publications including newsletters and reports included in the Jan. 1988 quarterly report from the project.
10. Johnston, W. B. Workforce 2000 Work and Workers for the 21st Century, Executive Summary. Hudson Institute, Indianapolis, Indiana, June 1987.
11. Kutscher, R.E. "An Overview of the Year 2000." Occupational Outlook Quarterly, p. 3–9, Spring 1988.
12. Lisack, J. P. "Occupational Employment Projections." Manpower Information Tid-Bit No. 86.1. Purdue University, West Lafayette, Indiana, 31 Jan. 1986
13. Lisack, J. P. and Shell, K. D. "Program Enrollment in Indiana Public Secondary Vocational/Technical Education: 1986–87." Manpower Information Tid-Bit No. 88–5, Purdue University, Lafayette, Indiana, 29 Aug. 1988.
14. Lisack, J. P. and Shell, K. D. "The Increasing Educational and Literacy Requirements of the U. S. Labor Force." Manpower Information Tid-Bit No. 88–6, Purdue University, Lafayette, Indiana, 29 Aug. 1988.
15. "Preparing Today for Tomorrow's Economy: State Responses to Structural Change." Anon. conference notes, Jobs for Indiana's Future, 25–26 Mar. 1988.
16. Quinn, J. B.; Baruch, J. J.; Paquett, P. C.; "Technology in Services." Scientific American, p. 50–58, Dec. 1987.
17. "Technical Training in America: How Much and Who Gets It?" Training and Development Journal, p. 18–32, Nov. 1988.
18. "The 1988–89 Job Outlook in Brief." Occupational Outlook Quarterly, p. 10–45, Spring 1988.
19. "Your Brilliant Career." Changing Times, p. 24–33, Nov. 1987.